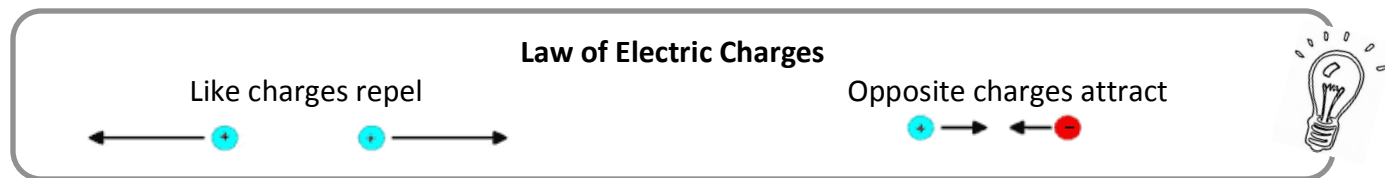


Grade 9 Science: Electricity

By: Anu Jain, Jasmine Chong, Rinkal Patel

Electric charge – A negative or positive amount of electricity that builds up in an object. All atoms contain electric charges.



How do objects become charged?

Charging by Friction – When two materials rub together to produce an electric charge. Materials that have a weak hold on electrons will become positively charged when they rub against materials that have a strong hold on electrons. *See Electrostatic Series*

Charging by Conduction – When a charged object touches an uncharged object, the extra electrons in the charged object will transfer to the uncharged object.

Charging by Induction – When a charged object induces movement of electrons in an uncharged object without direct contact.

Electrostatic Series

Sulphur
Brass
Copper
Ebonite
Paraffin Wax
Silk
Lead
Fur
Wool
Glass

Strong Hold on Electrons

Increasing tendency to hold on to electrons (negatively-charged)

Weak Hold on Electrons

Insulators vs. Conductors

Insulators – Materials in which electrons do not move freely. Ex: Oil, Fur, Silk, Rubber, Wax, Plastic

Conductors – Materials in which electrons move freely. Ex: Silver, Copper, Gold, Aluminum, Iron, Nickel

What is Current Electricity?

Current electricity – The movement of electric charge from one place to another

Term	Definition	Unit	Measurement Device
Voltage (V)	The electric potential per charge moving between terminals	Volts (V)	Voltmeter
Current (I)	The measure at which electric charges moves past a given point in a circuit	Amperes (A)	Ammeter
Resistance (R)	The measure of an objects opposition to the passage of a steady electric current	Ohms (Ω)	Ohmmeter

Ohm's Law



Potential difference = Electric current x Electrical resistance
 $V = I \times R$

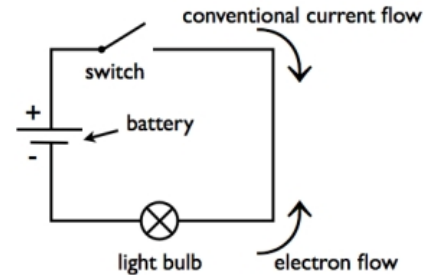


Circuits

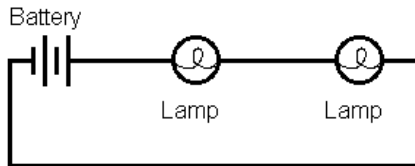
Electric circuit – Controlled path of flowing electricity in a complete circle

Features of an electric circuit:

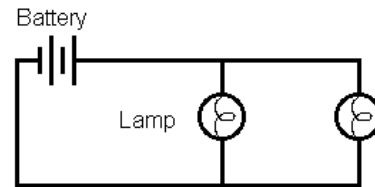
- 1) Source – Where the electricity comes from
- 2) Load: Where the electrical energy is transferred and converted
- 3) Control: A switch that starts and stops the electricity
- 4) Connectors: The paths where the electricity runs



Series Circuit – One path of electric charge



Parallel Circuit – Two or more paths for electric charge to follow (branches)



Electricity at Home

Types of Electric Current	
Direct Current (DC)	Alternating Current (AC)
Current in which charged particles travel through a circuit in only one direction	Current in which electrons move back and forth in a circuit

Electrical Power = the rate at which an appliance uses electrical energy.

Electrical Energy = the energy that is used by an appliance at a given setting; determined by multiplying the power rating of an appliance by the length of time it is used.

Efficiency of an electrical device is the ratio of useful energy output to the total energy input, expressed as a percentage.

$$\text{Percent Efficiency} = \frac{\text{Useful energy output}}{\text{Total energy input}} \times 100\%$$

Sources of Energy



Renewable: A source of energy that can be replaced in a relatively short period of time.
Ex: Tidal energy, biomass energy, geothermal energy, solar energy, moving water energy.

Non-renewable: A source of energy that cannot be replaced as quickly as it is used.
Ex: Energy from burning coal, energy from natural gas, nuclear fuel energy.